7. Conclusions and Suggestions

7.1. Suggestions

A few problems were found in the South African telecommunication industry during the research analysis (Chapter 6). This chapter will attempt to make some suggestions and conclusions on how the situation can be improved based on the technology transfer model (discussed in Chapter 4).

Telecommunications technology transfers can be improved through the use of a technology transfer model but the industry needs to follow a simultaneous-situation-improvement-plan (discussed in Section 7.1.2). The current suggested plan for South Africa thus involves two separate paths, which could be done in parallel as indicated in Figure 7.1. (Dotted-line block). The one path is focussed on the technology transfer and the other on the current situation in the country and how it is hindering the transfer model's success. These are:

- The Model for Telecommunication Technology Transfer/Diffusion into Rural Areas of South Africa (discussed in Chapter 4)

- A simultaneous-situation-improvement-plan

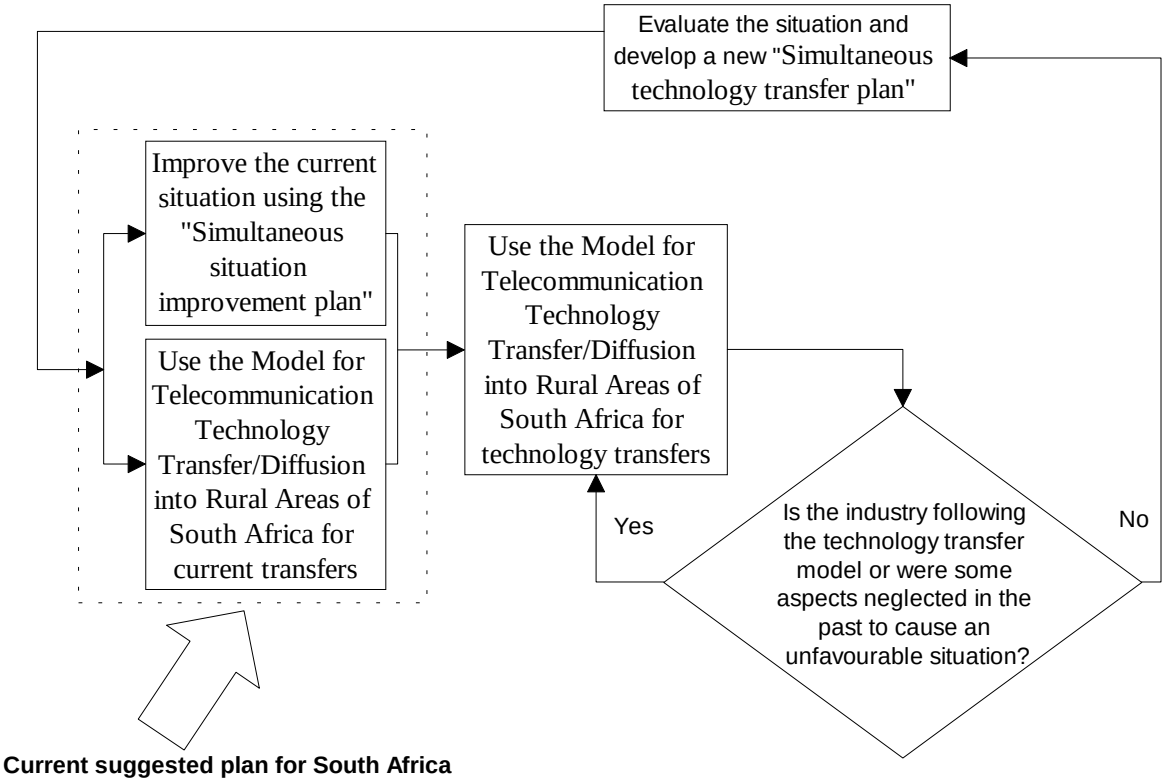

Figure 7.1. Improving the current situation of the telecommunications industry and future technology utilization through managing the technology transfer process according to the telecommunications technology transfer/diffusion model

After the initial parallel paths-strategy was followed the telecommunications industry can continue to transfer technology into rural South Africa following the technology transfer model (discussed in Chapter 4 - summarized in Section 7.1.1.)

The country's situation should however continuously be evaluated on the basis of the transfer model (Chapter 4) and the question asked whether the industry is following or followed the technology transfer model in all its aspects correctly or whether an unfavourable situation was created as a result of some aspects being neglected. If such a condition does occur the country should do a detailed evaluation of all aspects hindering the transfer model's success. A "simultaneous-situation-improvement-plan" should be developed and once again be performed in parallel with the transfer model on the way forward until the situation is corrected (see Figure 7.1).

The two suggested tactics for a current way forward is discussed below in Section 7.1.1 and Section 7.1.2.

7.1.1. The Model for Telecommunication Technology Transfer/Diffusion Into Rural Areas of South Africa

The Model for Telecommunication Technology Transfer/Diffusion into Rural Areas of South Africa forms the core of this dissertation that provides the industry with systematic guidelines including both parties (source and receiver). Technology transfer is a complex process that, if not managed wisely, can become a burden on national development. When transferring technology from one country/company to another, at different levels of technological know-how, the process holds many problems that need to be overcome. Problems exist and a proactive solution for future technology transfers is needed to avoid unsuccessful allocation of resources. Bracketed numbers refer to the blocks in the model shown in Figure 4.1 and Figure 4.2 (Chapter 4).

The policy maker identifies the stakeholders to form a team that evaluates and recommends to the policy maker the appropriate technology to transfer. Through this method the stakeholders' views and their cultural values are accounted for. It is extremely important to view the end users as stakeholders and to incorporate their ideas and needs into the transfer of technology (1). The development problem needs to be defined with a clear outlay of all the factors/problems that limit the overall growth or development of the involved country/company (2).

The needs of a country should be determined (3) using the Need-Capability Matrix as discussed in Chapter 3 (Section 3.3). The government furthermore delimit the borders of the telecommunications playfield through regulations and this influences the industry and it needs to be aware of all these regulations (4). One also needs to focus on strengths and not weaknesses and (5) therefore the model suggests the determination of capabilities (also a part in the Need Capability matrix).

Once a country knows its needs, capabilities, strengths, weaknesses, and limitations, it can form goals and objectives to solve the defined development problem (6). The evaluation of technology does not only become important after installation but needs planning through set standards. These standards are also useful to select a specific technology (7). Before selecting a technology a list of alternative technologies (8) and technology sources (10) must be generated together with technology assessment and forecasting (9), using

techniques such as: technological progress functions (S-curves), trend extrapolation, the Delphi method, and scenario development. A systematic approach is then suggested to narrow down the list (11).

The LDC should (12-16) evaluate its own ability to fulfil supportive tasks (energy provision, information management, maintenance, expansion, adoption, or supplying needed inputs) and plan accordingly through the use of Space maps (see Section 4.12). Then can the LDC select a technology and a technology source (17 - 24). Firstly, the hardware and software needs to be evaluated in terms of ease of adoption and ability of LDC to modify and develop its own technology (17). Thereafter input/output relationships are established and the AHP applied to obtain normalized weights (18) for ranking technologies by priorities (19-21). Goal compatibility is achieved between the MNC and the LDC through and process, which eliminates unwanted conflicting viewpoints on all three aspects of the technology triangle (Appendix A) as shown in Figure 4.6 (Chapter 4). This concludes the selection process of a technology source (22).

The technology transfer model suggests setting guidelines and standards (23) for achieving goals and evaluating the technology's success based on the defined needs and objectives. Regions are then also prioritised to select areas that will benefit most from the technology application (24 & 25). This aspect is described in more detail in Section 7.1.2.1. (Focus on right areas when doing rural network expansion or investments). The industry must realize that it can also play a role in assuring well-educated citizens through supporting the creation of appropriate educational and training systems (26) (also see Improve the quality of rural education in section 7.1.2.2.). With the gradual installation process of the newly transferred technology (see Figure 4.7. in Chapter 4), users need to be informed (27) as described in section 7.1.2.2. (Improve the awareness status of rural citizens).

A technological/need assessment and forecasting is conducted (28) with a continuous evaluation of the technology (29-36) to assure that the technology is fulfilling the need and helping the country to achieve its goals.

7.1.2. South Africa's Current Suggested "Simultaneous-Situation- Improvement-Plan"

Problems were found in five areas, which need attention before the technology transfer process will drastically improve the situation. A prescribed path is laid out for the preparation of the country's situation before the technology transfer model can be of use.

As described in Chapter 3, the literature suggests one of three basically different strategies to be followed:

1. ***Appropriate Technology for Current Infrastructure:*** Adapt the project fully to the local conditions

2. ***Compensate for Deficiencies in Current Infrastructure With Organizational Resources:*** Dedicate some of the organization's resources to compensate for the deficiencies of the given infrastructure

3. ***General Change of Infrastructure Corresponding to Technological Change:*** A course of general change in the infrastructure corresponding to the technological change is considered

In South Africa strategy 2 seems to be the best option to follow. It is actually a combination of the first and the last and can thus be broken up in these two interdependent strategies. Suggestions for a future strategy to follow, apart from the technology transfer model, are graphically presented in Figure 7.2.

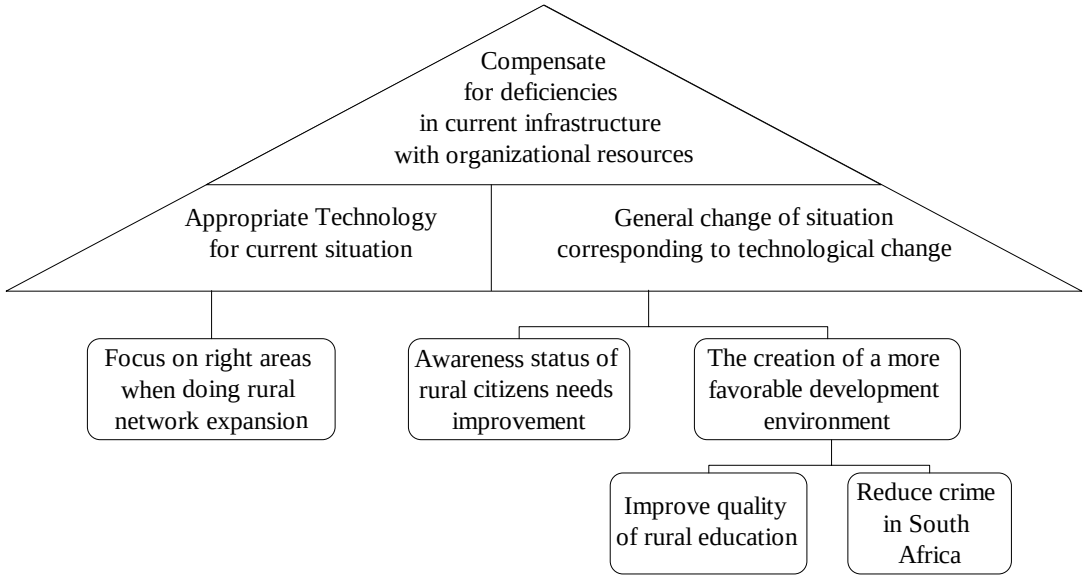

Figure 7.2. The "simultaneous-situation-improvement-plan" suggested for the South African telecommunications industry

Each aspect of the simultaneous-situation-improvement-plan will be discussed below.

7.1.2.1. "Appropriate Technology for Current Situation"

Focus on Right Areas When Doing Rural Network Expansion or Investments

A few relationships were tested during the survey done in Sekhukhuneland for pre-installation prioritisation of regions. Results showed that one could, on the basis of the different economic and social characteristics of citizens, explain how to prioritise regions. It is thus possible to predict which region will benefit most from technology improvements, or benefit most from gaining service for the first time. Villages with a high potential to benefit should enjoy a higher priority and they are:

- Villages with a high average level of education
- Villages with a high average monthly income (per capita)

Villages or regions should thus be evaluated before any technology installations are done and then be placed higher on a priority list for future rural network investments. It should however be stressed that the awareness of rural citizens is hindering technology utilization and should be improved with this aspect before the fixed-line service providers can include the second prioritisation parameter (monthly per capita income) as explained in Chapter 6.

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7.1.2.2. General Change of Situation Corresponding to Technological Change

Improve Awareness Status of Rural Citizens

The telecommunications industry should drastically plan to inform rural citizens since this was found to be the area where the most attention is needed. This aspect is included in the technology transfer model in block 27 but because of its status, it needs separate attention. It furthermore shows that this problem needs to be corrected before the transfer model (Chapter 4) will be valuable. It is however a task to be fulfilled not only by the industry but the authorities also has an active role to play. The government must first understand the advantages the telecommunication sector has to offer national development before they will participate in any awareness campaign, which will filter through the message to rural communities.

Insufficient awareness exists and it is limiting the advantages to rural South Africa as well as utilization and advantages to the telecommunication industry. Aspects that need better awareness includes:

- Knowledge on emergency services telephone numbers and their use
- Knowledge on fixed-line products from which rural citizens can benefit most
- Knowledge on SMS (Short message service)
- Knowledge on charging cellphone batteries
- Knowledge on use of Bank Cards for airtime purchase
- Knowledge on cellphone maintenance and repair

There are a number of mediums that can be used for effectively diffusing information on telecommunication into rural South Africa. The effectiveness of each medium differs and must be considered before an awareness campaign is launched. Media such as radio, television, posters on street, magazines, information flyers, newspapers, and even schoolteachers, to name but a few, could improve the situation of an ill-informed rural population in the country. One extremely important aspect that first needs consideration is the language used in the awareness uplifting process.

Language of awareness campaign

To inform people, the selected language plays a critical role. To cater for South Africa's diverse population, the Constitution provides for 11 official languages, namely Afrikaans, English, IsiNdebele, IsiXhosa, IsiZulu, Sepedi, Sesotho, Setswana, SiSwati, Tshivenda and Xitsonga [15]. According to Census '96, IsiZulu is the mother tongue of 22.9%, followed by IsiXhosa (17.9%), Afrikaans (14.4%), Sepedi (9.2%), and English (8.6%). To inform people effectively, one must evaluate small areas and conduct an informing campaign in the most spoken language for the specific area.

Telkom is actively working towards this goal already conducting business in all eleven official languages. A query in any language can be responded upon at the "Call Centres" and the "Services Prompts" is supporting clients in any of the following languages: Afrikaans, English, IsiXhosa, IsiZulu, Sesotho. MTN offer services in English and IsiZulu making them understandable to at least 32.1% of the population in their mother tongue while many of the other black languages also understand Zulu. Vodacom however conducts all their business only in English (9.2% of the population's mother tongue), which makes it difficult for them to be understood by all and definitely highly insensitive towards aiming for an informed customer.

Once the language for informing in a region is determined the medium should be selected. The choice on a medium is probably the most important determinant together with the appropriate language and both will determine the effectiveness of the awareness campaign. Different mediums will be briefly mentioned below with a short discussion on each and it's applicability.

Different Mediums for Informing Rural Citizens

Newspapers, posters on street, magazines, and information flyers as a medium for informing people: Newspapers, posters on street, magazines, and information flyers are all very successful mediums used in the developed sector. The only drawback is that people can only be reached using writing if they can actually read. This unfortunately is not the case for many (34.88%) of the rural citizens. According to Census '96 figures, 38.62% of the population in Sekhukhuneland has never been to school. Other mediums should thus be considered. Another drawback is that the cost of a newspaper or a magazine is out of reach for many of the people living in the rural areas, and only a limited percentage can thus be reached this way.

Schoolteachers: The educational system can play a definite role informing children. Through informing children, information can filter through to the parents and that way the whole community can be reached. There is however a problem with the educational system itself in South Africa. Children are often not being educated on the needed academic information let alone telecommunication information. Corruption has unfortunately also been experienced in the unproductive educational system. A 2-hour educational day is a common phenomenon at some secondary schools.

Nationwide strikes in education are also hindering development, which the country can't afford. Strikes in education will cost the country a high price socially because children will pay the price. Matric results are suffering as a result thereof [81].

Television: Television can be a very effective way to inform people on telecommunications. Both senses, hearing and seeing are reached and the recipient can be introduced into all the advantages that telecommunication has to offer. The SABC (South African Broadcasting Commission) are broadcasting some 98 news bulletins in all 11 official languages weekly [15]. Unfortunately the cost of a television set is out of reach for more than half the community living in the rural areas, and only a limited percentage (46.12%) can thus be reached this way. The need for a television license and electricity at home is another limiting factor because many people living in rural areas still cannot afford electricity let alone a license, and operating a television set on battery power is not very efficient.

Radio: Currently the SABC (South African Broadcasting Commission) has 19 radio stations under its control, attracting some 20 million listeners daily. Two of these stations, Radio Bop and CKI FM were inherited from the former homelands of Bophuthatswana and Ciskei respectively [15]. Different languages are being used when Radio Zulu Xhosa and Radio Seshoto were established on the 1st of June 1960. The SABC also introduced a radio service targeting the Khoi population in August 2000.

75.58% of the people living in the rural areas of South Africa own a working radio and this might be the most effective media for informing people. Using batteries as a power source for a radio is much more effective than with a television set and this fact puts a radio in reach of many rural citizens.

More than 80 community stations have been licensed since 1995 [15]. The minister of Communications is contributing by providing infrastructure in needy areas. Some R6.5 million [15] has been allocated for this program in the 2000/01 financial-year. Priority will be given to the Northern Province, Kwazulu-Natal and Eastern Cape, which have been identified for the first phase of integrated sustainable rural development.

The needed infrastructure for establishing a community radio station is however not always available. In Sekhukhuneland, a BSC Computer Science graduate explained that he is trying to start a community radio station but has difficulty in doing so because of not having Internet access that makes the attempt almost impossible.

Government Should Ensure a Favourable Development Environment

The government does not do everything in its power to create a favourable atmosphere for technological development but have strict regulations and policies in place to penalize the telecommunication industry if they don't perform adequately. The situation in a country must often be evaluated from the perspective of a foreign investor who is additionally disadvantaged by relying on largely second-hand information.

Improve Quality of Rural Education

The "People" component of the technology triangle (see Appendix A) is often ill educated and its hindering technology utilisation. Without a high average level of literacy, rural South Africa will never be able to modify or adjust transferred technology for optimisation to local conditions which will make the utilisation uncompetitive in the international market. South Africa can, through creation of a continuous learning culture conduct sustainable development to become technological self-sufficient.

The quality of the South African educational system in rural areas is unfortunately insufficient. During the survey conducted in Sekhukhuneland, signs of unproductiveness were found, as a two-hour school day seemed normal to some secondary schools.

A clear indication of a doubt in the quality of rural schools is the "Denel Bridging Programme". Kentron (a division of Denel) is a manufacturer of tactical missiles, precision-guided weapons, unmanned aerial vehicles, and sighting or observation systems in South Africa. They have developed their Bridging Program for disadvantaged students with limited tertiary education prospects. The Denel Bridging Programme is housed at

Kentron College, on the premises of Kentron in Irene, Centurion near Pretoria. The aim of the College is to provide an annual bridging course for students from previously disadvantaged communities [83]. During the Program students re-do Grade 12 Mathematics, Physical Science or Accounting and upgrade their marks. They also get taught basic communication, leader, and other personal skills. Upon successful completion of the course, participants may qualify for a bursary to study in Electronic/Mechanical Engineering or Auditing.

While the telecommunications industry has committed itself to be actively involved in education and training (Discussed in Chapter 6: Develop appropriate educational and training system (26)) the government should focus much more on improving the quality of the educational system in South Africa.

Reduce Crime in South Africa

The reduction of crime in South Africa falls under the creation of a more favourable development environment for which the government can be held responsible to a large extend. This does not imply that the telecommunications industry has no action to fulfil. The industry can in turn, also improve the situation and the author is happy to say that it is actively involved at the moment (explained below). While the industry is doing almost everything in its power the government is not doing enough at all. The state is blaming other countries for "poaching" doctors and teachers but not acknowledging the push factors.

The point that should be stressed is to keep focussing on crime reduction. The involvement of the different telecommunication companies in South Africa's crime reduction will briefly be explained below.

Telkom:
Telkom finds the impact of crime on the company as extremely high and a strategy is followed to counteract crime. Currently Telkom is at a position where the amount and size of theft incidents decline even with network growth.

Telkom offers free emergency number dialling to their customers. These include numbers for ambulance services, fire brigade, police, hospitals and rescue services [84]. The public is also made aware of these numbers in the White Pages Telkom Directory.

Copper cable theft is a huge problem in South Africa. In addition to the inconvenience caused to customers, cable theft costs Telkom an estimated R28 million annually [58]. To ease this problem, Telkom is connecting large parts of South Africa using advanced radio-based telecommunications technology called DECT (Digital Enhanced Cordless Telecommunications). Services made available for better safety by Telkom includes: UrgentCall (UrgentCall allowing the user to make a pre-programmed call by lifting the handset 5 seconds), SpeedCall (SpeedCall makes a call by dialling only a few digits, instead of dialling the complete telephone number), and IdentiCall (Lets the user see the caller's number before answering).

Vodacom:
At the end of 1994, as South Africans were planning their end of year holidays, Vodacom was rolling out its network on 3 000 km's [22] of national highway. This strategy made

cellphones increasingly essential for personal safety. By the beginning of 1995, Vodacom expanded its emergency service to launch Vodacom 702 Cellwatch, broadcasting incidents of stolen or hijacked vehicles.

Vodacom hit back harder at cellphone thieves during 1998 with an initiative to encourage the public to blacklist cellphones when stolen and to discourage them from buying stolen cellphones. Blacklisting has the effect of rendering cellphones inoperable on GSM networks around the world. Vodacom educated the public with an information line (124 from cellphones or 082 124 from a Telkom phone [22]), which details the correct procedure for blacklisting a cellphone. Vodacom has also placed a blacklist information sticker on all prepaid starter packs.

Vodacom Group CEO Alan Knott-Craig committed Vodacom to upgrading and maintaining the Alexandra Police Station and the adjoining Magistrates Courts, a project that cost R15 million [5]. The aim is that people should not be risking their lives because they do not have access to the proper equipment and facilities, especially when there are others who do. By upgrading the Alexandra police station and magistrate's courts, Vodacom has undertaken to renovate, refurbish and maintain them for at least three years. This includes the installation of telecommunications and IT equipment. Now that the restoration is complete, Alexandra enjoys a modern, well-equipped policing facility that has had a profoundly positive effect on the morale of police officers and the community. One of the new features is a trauma centre in which victims of crime are counselled and statements taken in private.

On March 22, 2001 Vodacom pledged a further R1,4-million [5] to the Alexandra Police Station as part of its commitment to work in partnership with government to fight crime. The Chief Executive of Vodacom, Mr. Alan Knott-Craig, and the Chairman of the Vodacom Foundation, Ms Joan Joffe, made the donation, which will be used to provide essential maintenance and services, at the Alexandra Police Station.

Vodacom has also implemented several security devices for its prepaid vouchers to prevent fraud. These include: sealed vouchers in a clear plastic cover together with holograms, expiry dates, and unique card numbers printed on the back of the cards. This way it is almost impossible to sell used or forged cards to the public as new unused ones.

Vodacom spent a further R5 million sponsoring the printing of 7.5 million "Passports to Safety", which are anti-crime brochures containing useful information to help beat crime. Vodacom is a patron of Business Against Crime (Gauteng) and donated R1 million in this regard. Vodacom donated R250 000 to a program aimed at rehabilitating prisoners by teaching them how to read and write.

MTN:
One of MTN's exclusive value-added services includes CareCall. This service is a peace-of-mind line that complements the112 Emergency number [24]. MTN offer coverage along most of South Africa's national highways ensuring better safety on the roads.

The MTN Centre for Crime Prevention Studies (CCPS) at Rhodes University ended the year on a high note by scooping a coveted emPower Award at the 11th Annual PMR (Professional Management Review) Awards ceremony in Johannesburg. The emPower Awards recognize organizations that demonstrate excellence in contributing to the

reconstruction and development of South African society. Many of South Africa's leading companies and organizations enter for the awards each year. For the 2000 Awards, entries were judged in the following categories: War Against Crime, Black Economic Empowerment, Environmental Protection, Primary Health Care, Job Creation and Training and Social Upliftment. Cellular giant MTN entered the CCPS in the War Against Crime category [85].

Cell C:
Cell C (not yet an active cellular service provider) said in a statement that additional services to be provided include: directory, information, emergency, messaging and operator assisted services [32].

7.2. Conclusions

Telecommunication can no longer remain just as a luxury to the few privileged in big civilised cities and a dream to the rural citizens. If this way of thinking is continued, South Africa will indeed pay a very high price. The question is not whether rural telecommunication is needed but rather how to go about making rural telephony available. The telecommunication technology transfer model tries to answer this question and supply guidelines on how to enable rural telecommunication to be socially and hopefully economically profitable in the future.

If it weren't for the developed sector in South Africa the necessary support activities would not have been present and the underdeveloped sector would have difficulty in becoming a contributing element in sustainable growth. The country's developed sector can't keep on carrying the underdeveloped sector and also expect to stay a role-player in the highly competitive international market. Rural South Africa should also start playing its part and the only way this can be done is through the necessary infrastructure that includes telecommunications.

The telecommunications industry is covering many of the aspects highlighted in the technology transfer model and technologies are currently transferred to South Africa fairly satisfactory. However, many areas still exist where much can be done to make it more effective and more rewarding to society as well as the industry. A number of aspects are present within the industry's power, which are not up to standard at all and should get special attention urgently. The government also has a vital role to play to ensure sustainable growth and to allow telecommunications to play its part in national development.

Future research can be done to determine the magnitude of the problem of rural education's quality. The national situation should be evaluated and a systematic solution derived on a program to follow that will improve the situation.